

Remarks

Reconsideration and further examination of the above-identified patent application in light of the present Amendment, Reply, and Remarks is respectfully requested.

This Amendment has been made to put the application in condition for immediate allowance or in better form for appeal, if needed. No new issues have been raised which require a further search.

Authorization is hereby given to charge any deficiency in fees or any other fees in connection with the above-identified patent application to our Deposit Account No. 23-0920.

Claims 1-4, 7, 11, 13, 16, 18-20, 22, 27-28, 31-33 and 37-39 were pending prior to this Amendment.

Claims 5-6, 8-12, 14-15, 17, 21, 23-26, 29-30 and 34-36 have been canceled.

Claims 1, 4, 16, 19-20, 22, 31 and 37-39 have been amended to more particularly point out and distinguish applicant's invention over the references of record. Antecedent basis and support for the Amendment is found in the specification, original claims and drawings.

The matters objected to in claims 1-4, 7, 11, 13, 16, 18-20, 22, 27, 28, 31-33 and 37-39 have been corrected or canceled as per the Primary Examiner's requests in order to make the claims more definite and clear and better comply with 35 USC 112. In particular, claims 1-4, 7, 11, 13, 16, 18-20, 22, 27, 28, 31-33 and 37-39 have been amended to more particularly point and distinctly claim the subject matter which the applicant regards as the invention to better comply with 35 USC 112, 2nd paragraph. Furthermore, claims 1-4, 7, 11, 13, 16, 18-20, 22, 27, 28, 31-33 and 37-39 have been amended to better comply with the written description requirements of 35 USC 112, 1st paragraph.

Claims 1-4, 7, 13, 16, 18-20, 22, 27-28, 31-33 and 37-39 are presently pending for the consideration of the Primary Examiner.

Applicant's amended independent claim 1 pertains to a UV curing method for applying UV light to UV photo initiators in UV curable inks, coatings, or adhesives on the surfaces of the products, articles or other solid objects. In the method of applicant's amended independent claim 1, visible light is emitted a specific intensity from a set of visible light LED assemblies secured to a panel onto the UV curable inks, coatings, or adhesives on the surfaces of the products, articles or other solid objects facing the visible light and the visible

light LED assemblies. A first wavelength of UV light is emitted from a first array of UV LED assemblies secured to the panel onto the UV curable inks, coatings, or adhesives on the surfaces of the products, articles or other solid objects that face the first array of UV LED assemblies and the UV light comprising the first wavelength of UV light and at the same intensity as the visible light. A second wavelength of UV light is emitted from a second array of UV LED assemblies secured to the panel onto the UV curable inks, coatings, or adhesives on the surfaces of the products, articles or other solid objects that face the second array of UV LED assemblies and the UV light comprising the second wavelength of UV light and at the same intensity of the visible UV light and the UV light comprising the second wavelength of UV light. The panel is moved in proximity to or adjacent the UV curable inks, coatings, or adhesives on the side surfaces of the products, articles or other solid objects while visible light is emitted from the visible light LED assemblies and UV light is emitted from the first and second array of UV LED assemblies. In the method of applicant's amended claim 1, the claimed surfaces of the products, articles, and other solid objects face the visible light LED assemblies and the first and second array of UV LED assemblies on the panel. Advantageously, the first and second wavelengths of UV light are distributed equally at the same intensity onto the UV curable inks, coatings, or adhesives on the surfaces of the products, articles or other solid objects facing the first and second arrays of UV LED assemblies secured to the panel, while simultaneously visible light is distributed equally at the same intensity on the same surfaces of the products, articles, and other solid objects facing the said visible light-emitting LED assemblies secured to the panel, as the panel is being moved. Concurrently, the UV curable inks, coatings, or adhesives on the surfaces of the products, articles or other solid objects are uniformly cured without and in the absence of masks, forming spacer patterns, electric circuits for printed circuit boards, dental material, water purification, and insect lights so that the UV curable inks, coatings, or adhesives on the surfaces of the products, articles or other solid objects are polymerized in an identical manner.

Speakman UK Patent Application GB 2,350,321A ("Speakman") pertains to a method of forming a masking or spacer pattern on a substrate to print electric circuits for printed wiring boards and, therefore, does not pertain to applicant's amended independent claim 1.

Contois et al. U.S. Patent No. 4,980,701 (“Contois”) pertains to a non-impact printhead using a mask with a dye etc. and, therefore, does not pertain to the method of applicant’s amended independent claim 1.

Kennedy et al. U.S. Patent No. 5,634,711 (“Kennedy”) pertains to a portable light-emitting apparatus for a use by dentists to thermocure dental materials and, thereby, does not pertain to the method of applicant’s amended independent claim 1.

Dowling et al. U.S. Patent Application Publication No. US2002/0074559A1 (“Dowling”) pertains to water purification systems and insect lights and, thereby, does not relate to the method of applicant’s amended independent claim 1.

Young U.S. Patent No. 6,561,640 (“Young”) and Biegelsen et al. U.S. Patent No. 6,536,889 (“Biegelsen”) whether taken individually or in combination with Dowling, Contois, Kennedy and/or Speakman do not fully disclose applicant’s method as now recited in amended independent claim 1.

Applicant’s claims 2-4, 7, and 13 are directly dependent upon applicant’s amended independent claim 1 and thereby, necessarily require all the steps, features and limitations of applicant’s amended independent claim 1. Furthermore, applicant’s claims 2-4, 7 and 13 require additional steps, features and limitations which are not disclosed in Young and Biegelsen, whether taking individually or in combination with Dowling, Contois, Kennedy, and/or Speakman, such as: injecting an inert gas in a space between the panel and the UV curable inks, coatings or adhesives on the surfaces of the products, articles or other solid objects; cooling the first and second arrays of UV LED assemblies within a predetermined range; varying current drawn by UV LED chips of the first second arrays of UV LED assemblies between 5% and 10%, etc.

Applicant’s amended independent claim 16 is directed to a UV apparatus for applying UV light to UV photo initiators in UV curable inks, coatings, or adhesives on the surfaces of the products, articles or other solid objects. Applicant’s amended independent claim 16 recites many similar features and limitations as specified in applicant’s amended independent claim 1. Furthermore, applicant’s amended independent claim 16 requires a controller that is operatively connected to the visible LED assemblies as well as to the first and second array of UV LED assemblies and the panel-moving mechanism to concurrently distribute the first and second wavelengths of UV light from the UV LED assemblies equally onto the UV curable inks, coatings, or adhesives on the surfaces of the products, articles or other solid objects,

while visible light is distributed from the visible LED assemblies onto the UV curable inks, coatings, or adhesives on the surfaces of the products, articles or other solid objects, as the panel is moved to uniformly cure the UV curable inks, coatings, or adhesives on the surfaces of the products, articles or other solid objects without and in the absence of masks, forming spacer patterns, electrical circuits for printed wiring boards, dental material, water purification, and insect lights, so that the UV curable inks, coatings, or adhesives on the surfaces of the products, articles or other solid objects are similarly polymerized.

The comments discussed above concerning the deficiencies of Speakman, Contois, Dowling, Kennedy, Young and Biegelsen are also applicable to applicant's UV apparatus of applicant's amended independent claim 16.

Young and Biegelsen, whether taken individually or in combination with Dowling, Contois, Kennedy and/or Speakman, do not disclose the structural elements, features and limitations of applicant's apparatus as provided in amended independent claim 16.

Claims 18-20, 22 and 27-28 are directly dependent upon applicant's amended independent claim 16 and, thereby, necessarily require all the structural elements, features, and limitations of applicant's independent claim 16. Furthermore, applicant's claims 18-20, 22 and 27-28 specify additional structural elements, features and limitations which are not fairly taught or suggested by Young and Biegelsen, whether taken individually or in combination with Dowling, Contois, Kennedy, and/or Speakman, such as: a gas injector for injecting an inert gas in a space between the panel and the UV curable inks, coatings, or adhesives on the surfaces of the products, articles or other solid objects; a splatter-resistant protective device to prevent splatter from contacting the UV and visible light assemblies; curing equipment to cool the UV and visible light UV LED assemblies; large junction UV LED chips over 400 microns on a side; UV LED chips with a current drain which only varies between 5% and 10%; etc.

Applicant's amended independent claim 31 is directed to a UV curing method for applying UV light onto UV photo initiators in UV curable inks, coatings, or adhesives on the surfaces of the products, articles or other solid objects. In the method of applicant's amended independent claim 31, UV light is emitted from UV LED chips on a substrate onto UV curable inks, coatings, or adhesives on the surfaces of the products, articles or other solid objects. In the UV curing method of applicant's amended independent claim 31, UV light is emitted from UV LED chips on a substrate onto UV curable inks, coatings, or adhesives on

the surfaces of the products, articles or other solid objects. The UV LED chips are cooled with a variable speed fan and a heat sink. The substrate is moved relative to the UV curable inks, coatings, or adhesives on the surfaces of the products, articles or other solid objects. Advantageously, the light intensity of the UV light that is emitted from UV LED chips are sensed and the temperature of the heat sink or UV LED chips are sensed. The speed of the variable speed fan is adjusted or controlled in response to the sensed temperature of the heat sink or the temperature of the UV LED chips. Desirably, the temperature of the UV LED chips are maintained at a generally constant temperature and the light intensity of the UV light are maintained at a generally constant level. Significantly, the UV curable inks, coatings, or adhesives on the surfaces of the products, articles or other solid objects are uniformly cured in a similar manner without and in the absence of masks, forming spacer patterns, electric circuits for printed circuit boards, dental material, water purification and insect lights, so that the UV curable inks, coatings, or adhesives on the surfaces of the products, articles or other solid objects, are similarly polymerized.

The defects of Speakman, Contois, Dowling, Kennedy, Young and Biegelsen discussed above with respect to applicant's independent claims 1 and 16, apply to many aspects of applicant's UV curing method of applicant's amended independent claim 31 and, to the extent applicable to applicant's amended independent claim 31, are hereby incorporated by reference.

Young and Biegelsen, whether taken individually or in combination with Dowling, Contois, Kennedy and/or Speakman, do not sense the light intensity of UV light let alone UV light emitted from UV LED chips, as specified in applicant's amended independent claim 31. Furthermore, Young and Biegelsen, whether taken individually or in combination with Dowling, Contois, Kennedy and/or Speakman, do not sense the temperature of a heat sink or UV LED chips, as required in applicant's amended independent claim 31. Moreover, Young and Biegelsen, further taken individually or combination with Dowling, Contois, Kennedy and/or Speakman, do not disclose maintaining the temperature of UV LED chips at a generally constant temperature, as recited in applicant's amended independent claim 31. Also, Young and Biegelsen, whether taken individually or in combination with Dowling, Contois, Kennedy and/or Speakman, do not disclose maintaining the light intensity of UV light at a generally constant level, as now provided in applicant's amended independent claim 31.

The steps, features, and limitations of applicant's amended independent claim 31 are not disclosed in Young and Biegelsen, whether taken individually or in combination with Dowling, Contois, Kennedy and/or Speakman.

Applicant's amended independent claim 32 pertains to a UV curing apparatus for applying UV light onto UV photo initiators in UV curable inks, coatings, or adhesives on the surfaces of the products, articles or other solid objects. The UV curing apparatus of applicant's amended independent claim 32 requires: a set of UV LED chips, a heat sink, a variable speed fan, a moving mechanism, and light sensor to sense the intensity of UV light emitted from the UV LED chips. Applicant's UV curing apparatus of amended independent claim 32 also requires a control circuit coupled to the light sensor and to the variable speed fan for controlling the light intensity of UV light emitted from the UV LED chips as well as for controlling the temperature of the UV LED chips by regulating the speed of the air blown by the variable speed fan on the heat sink or on the UV LED chips and by varying the speed of the variable speed fan in response to the sensed intensity of the UV light to uniformly cure the UV curable inks, coatings, or adhesives on the surfaces of the products, articles or other solid objects in a similar manner, without and in the absence of masks, forming masking patterns, electric circuits for printed wiring boards, dental material, water purification, and insect lights, so that the UV curable inks, coatings, or adhesives on the surfaces of the products, articles or other solid objects, are similarly polymerized.

Young and Biegelsen, whether taken individually or in combination with Dowling, Contois, Kennedy and/or Speakman, do not provide a variable speed fan, let alone a light sensor to sense the intensity of UV light, as required in applicant's amended independent claim 32. Furthermore, Young and Biegelsen, whether taken individually or in combination with Dowling, Contois, Kennedy and/or Speakman, do not disclose a control circuit coupled to a light sensor as well as to a variable speed fan, as required in applicant's amended independent claim 32.

The structural elements, features and limitations of applicant's UV curing apparatus of amended independent claim 32 are not fairly disclosed in Young and Biegelsen, whether taken individually or in combination with Dowling, Contois, Kennedy and/or Speakman.


Applicant's claims 37-39 are directly dependent upon applicant's amended independent claim 32 and, therefore, necessarily require all the structural elements, features and limitations of applicant's amended independent claim 32. Furthermore, applicant's

claims 37-39 also require other structural elements, features and limitations which are not taught or suggested by Young and Biegelsen, whether taken individually or combination with Dowling, Contois, Kennedy and/or Speakman, such as a turntable, etc.

In summary, this Amendment has been made to comply with the Primary Examiner's requests, cure the Primary Examiner's objections, and patentably distinguish applicant's claims over the cited prior art references of record. Accordingly, it is respectfully submitted that the above-identified application is now in condition for allowance. A Notice of Allowance is respectfully requested.

The Primary Examiner is invited and encouraged to contact the undersigned attorney in order to expedite the application to allowance, if the preceding does not already place the above-identified application in condition for allowance.

Respectfully submitted,



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